

The Baltic Soil Survey (BSS): Sub-continental scale geochemical mapping of agricultural soils from northern Europe

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From 1996 to 2003 the Geological Survey of Norway (NGU) coordinated a project to map the regional variation of 62 chemical elements in agricultural soils collected from a 1.800.000 km² area covering 10 countries in Northern Europe. Large (10-15 kg) composite soil samples of the Ap-horizon (0-25 cm) and the B- or C-horizon (50-75 cm) were collected at a density of 1 site per 2500 km². The <2 mm fraction of all samples was analysed following three different extraction methods: ammonium acetate, aqua regia, a HF-HClO₄-HNO₃-H₂O₂ mixture and by XRF. Methods and results are documented in a geochemical atlas (Reimann et al. 2003).

The maps show large regional differences in background levels for all elements. These need to be established via continental scale geochemical mapping; they are not predictable via models. For all elements, a variety of different factors (e.g., precipitation, temperature, topography, geology, pollution) and often a combination of more than just one process determine the observed regional distribution of the elements. At this sub-continental scale, the occurrence of metallogenes and biogeochemical domains are the most important factor influencing the regional distribution of the 62 chemical elements mapped.

In the As-map an anomaly covering more than 250.000 km² appears in Central Sweden in the general area of the Skjellefteå ore district. The anomaly could thus be seen as the expression of a metallogenic province or metallogene. However, this anomaly cuts several established geological boundaries and is much larger than the ore field. A different origin must be considered. Crustal degassing due to a heatflow anomaly is one possible interpretation. Another interesting feature in the As-map are increasing values towards the southern border of Poland on leaving the cover of glacial sediments and entering the Carpathian region with different soil development. At the same time much of Poland's metal industry is located in the same area. Slightly higher As-values in the BOT-layer point towards the natural sources of As dominating the distribution.

Use of fertilisers or differences in traffic density, often in connection with other factors like climate and organic material, can influence the distribution of some elements on a national-scale (e.g. Cd, Cu, Se). Established geological boundaries are rarely seen in the maps. The occurrence of some geochemically unusual lithologies, such as black shale, is clearly shown in some maps (e.g. Cu, Se).

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Agricultural Soils in Northern Europe: A Geochemical Atlas. Geologisches Jahrbuch, Sonderhefte, Reihe D, Heft SD 5, Schweizerbart'sche Verlagsbuchhandlung, Stuttgart: 279p.